

IGBT modules: T series NX type reliability test results

Table 1. Reliability test results

The results for representative module are shown in below table.

Test Category 試験項目	Test condition 試験条件	Number of samples 試料数	Number of failures 故障数	
Temperature cycling 温度サイクル	-40 °C ~ 125 °C (air), 10 cycles t=60 minutes at each temp.	5	0	
Variable frequency vibration 振動	10Hz - 500Hz / 15 min., 100m/s ² =10G, X, Y, Z : 2 hours in each direction.	5	0	
Terminal strength 端子強度(引張)	19.6N (signal terminals), 10 seconds	5	0	
Tightening strength 締付トルク強度	Main terminals: 4.5N·m(M6) Mounting to heat sink: 3.5N·m(M5)	5	0	
Soldering thermostability はんだ耐熱	260°C, 10 seconds (signal terminals)	5	0	
Solderability はんだ付け性	245°C (signal terminals), 5 seconds	5	0	
High temperature Storage 高温保存	Ta=125 °C t=1000 hours	5	0	
Low temperature Storage 低温保存	Ta=-40 °C t=1000 hours	5	0	
Moisture resistance 耐湿性	Ta=60 °C, 90 %RH t=1000 hours	5	0	
High temperature reverse bias 高温逆バイアス	Tvj=150 °C, VCE(DC)=VCES(rating) × 0.85, VGE=short, t=1000 hours	5	0	
High temperature gate bias 高温ゲートバイアス	Tvj=150 °C, VCE=short, t=1000 hours	VGE(DC)=+20V	5	0
		VGE(DC)=-20V	5	0
Intermittent operation life 断続通電	Tc=50~100 °C, 5,000 cycles	5	0	

Table 2. Failure criteria

Parameter 測定項目	Measurement conditions 測定条件	Criteria for failure 故障判定基準	
		Lower/下限	Upper/上限
ICES	VCE=VCES(rating), G-E short-circuited	—	U.S.L.×2.0
IGES	VGE=VGES(rating), C-E short-circuited	—	U.S.L.×2.0
VGE(th)	IC=IC(rating)/10000A, VCE=10V	L.S.L.×0.8	U.S.L.×1.2
VCEsat	IC=IC(rating)A, VGE=15V	—	U.S.L.×1.2
VEC	IE=IE(rating)A, G-E short-circuited	—	U.S.L.×1.2
Visol	Visol= Visol(rating), AC 1 minute between shorted all terminals and base plate	Break down	

Additional notes:

- The measurements are performed under our determined temperature and humidity environment.
- The symbols in the table are as follows.
U.S.L : Upper Specification Limit
L.S.L : Lower Specification Limit
- The U.S.Ls and L.S.Ls are determined on the basis of Specification, which is designated as our standard module specification. In regards to those not defined in Specification, our own internal specifications are applied in lieu thereof.
- The measurement items of each test are selected according to our standards

IGBT modules: T series NX type reliability test results

Keep safety first in your circuit designs!

Mitsubishi Electric Corporation puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage. Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) safety margin, (ii) placement of substitutive, auxiliary circuits, (iii) use of non-flammable material or (iv) prevention against any malfunction or mishap. Before the adoption of semiconductor products, the reference to individual application notes is recommended.

Mitsubishi Electric Corporation assumes no responsibility for any damage with customer safety design deficiency and/or usage of out-range of specification.

Notes regarding these materials

- These materials are intended as a reference to assist our customers in the selection of the Mitsubishi semiconductor product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Mitsubishi Electric Corporation or a third party.
- Mitsubishi Electric Corporation assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts, programs, algorithms, or circuit application examples contained in these materials.
- All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by Mitsubishi Electric Corporation without notice due to product improvements or other reasons. It is therefore recommended that customers contact Mitsubishi Electric Corporation or an authorized Mitsubishi Semiconductor product distributor for the latest product information before purchasing a product listed herein.

The information described here may contain technical inaccuracies or typographical errors. Mitsubishi Electric Corporation assumes no responsibility for any damage, liability, or other loss arising from these inaccuracies or errors.

Please also pay attention to information published by Mitsubishi Electric Corporation by various means, including the Mitsubishi Semiconductor home page (<https://www.mitsubishielectric.com/semiconductors/powerdevices/>).

- When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithms, please be sure to evaluate all information as a total system before making a final decision on the applicability of the information and products. Mitsubishi Electric Corporation assumes no responsibility for any damage, liability or other loss resulting from the information contained herein.
- Mitsubishi Electric Corporation semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Mitsubishi Electric Corporation or an authorized Mitsubishi Semiconductor product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
- The prior written approval of Mitsubishi Electric Corporation is necessary to reprint or reproduce in whole or in part these materials.
- If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination.

Any diversion or re-export contrary to the export control laws and regulations of Japan and/or the country of destination is prohibited.
- Please contact Mitsubishi Electric Corporation or an authorized Mitsubishi Semiconductor product distributor for further details on these materials or the products contained therein.